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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/707,366	12/09/2003	**Kenneth Boyd**	81092490	1365

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EXAMINER	
JONES, HUGH M	
ART UNIT	**PAPER NUMBER**
2128	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/707,366	BOYD ET AL.	
	Examiner	Art Unit	
	Hugh Jones	2128	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _09 October 2008_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-20_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-20_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _12/9/2003_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-20 of U.S. Application 10/707,366 filed 12/9/2003 are pending.

Claim Interpretation

2. Some claims call for a "controller". However, in so far as the claims are directed to a computer simulation, it is unclear what is being "controlled" other than the simulation itself. The claims are so interpreted.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sharp et al., "Optimal Preview Car Steering Control," published in Vehicle System Dynamics, Volume 35, no. ICTAM, in 2001, in view of Peng et al.,

"Optimal Preview Control for Vehicle Lateral Guidance" California Partners for Advanced Transit and Highways 1991.

6. Sharp discloses a simulation system for simulating an operation of an automotive vehicle comprising:

1. A simulation system for simulating operation of an automotive vehicle, said simulation system comprising:
an input device for providing vehicle information (page 2 section 2) and path information (page 4 section 3);
a controller coupled to said input device and operable to simulate said automotive vehicle using a vehicle computer model wherein said controller is programmed to determine 39a rear side slip angle (pg. 3, fig. 2) of said vehicle computer model (page 1 last paragraph lines 8-11; page 5 figure 3; angle of curvature of road *is proportional to slip angle*); determine an initial steering wheel angle that is input to said vehicle computer model (page 6 first full paragraph, *when k=1*);
when said rear side slip angle is determined to be greater than a predetermined threshold, determine a look ahead scale factor and an initial look ahead point (page 4 section 3 second paragraph, *y.sub.rh;* page 10, *second full paragraph, taught as setting a preview time based on the curvature of the path which is proportional to the slip angle;* (P: page 9 equation 17) and increase the distance of a look ahead point substantially on or near an intended vehicle path as a function of said look ahead scale factor (page 5 figure 3, *taught as computing the road angle which corresponds to the slip angle*; page 10, *second full paragraph, taught as setting a preview time based on the curvature of the path which is proportional to slip angle*);
determine a new steering wheel angle, which is input to said vehicle computer model at a time later than said initial steering wheel angle, by comparing said intended vehicle path with said look ahead point on or near said intended vehicle path (page 10, *second full paragraph, taught as using the preview time in order to determine the preview point ahead of the car; taught as "using the perceived path error to steer the 'correct' way"*);
operate said vehicle computer model with said initial steering wheel angle or said new steering wheel angle (page 5 last paragraph-page 6 first paragraph, *taught as using the system with the steering wheel angle input*); and
generate an output in response to said vehicle computer model and said initial steering wheel angle or first said new steering wheel angle (page 5 figure 4, *taught as the error being based on the steering wheel angle input)*.

Sharp does not disclose expressly the path information comprising a road radius of curvature, or the look ahead scale factor being a function of the intended path radius of curvature which is proportional to slip angle. Peng discloses a method controlling a vehicle using an optimal preview control algorithm. Peng teaches the input having path information containing a radius of

curvature (**page 6 last paragraph**). Peng further teaches determining a look ahead scale factor as a function of the intended path radius of curvature (**page 9 equation 17**, *taught as a function of w, which is disclosed in page 6 last paragraph as the inverse of the radius of curvature*).

It would have been obvious to one of ordinary skill in the art of steering control, at the time of the present invention, to modify Sharp's method of determining a look ahead scale factor with Peng's use of the radius of curvature. The motivation for doing so would have been to reduce error in calculating preview data by taking into consideration changes in road curvature (Peng page 5 first two paragraphs).

2. A simulation system as recited in claim 1, wherein said predetermined threshold is about 15 degrees (engineering design choice).

3. A simulation system as recited in claim 1, wherein said controller is programmed to determine both a longitudinal vehicle velocity and a lateral vehicle velocity and also determine said rear side slip angle as a function of said longitudinal vehicle velocity and said lateral vehicle velocity (pg. 3, fig. 2; inherent – par. 29, spec) .

4. A simulation system as recited in claim 1, wherein said controller is programmed to determine said look ahead scale factor as a function of said rear side slip angle (page 10 last paragraph, taught as high oscillation requiring higher preview times).

5. A simulation system as recited in claim 1, wherein said controller is programmed to determine said look ahead scale factor as a function of an exponential of said rear side slip angle (design choice; page 10 second full paragraph, *taught as the scale factor being 1.5 at high speeds or 1, which is 2/3 of the maximum of 1.5, at low speeds; arbitrary use of exponential function*).

6. A simulation system as recited in claim 1, wherein said controller is programmed to determine said look ahead scale factor as a function of an exponential of a product of said rear side slip angle and a constant (design choice; page 10 second full paragraph, *taught as the scale factor being 1.5 at high speeds or 1, which is 2/3 of the maximum of 1.5, at low speeds*).

7. A simulation system as recited in claim 6, wherein said constant is about 0.02 (design choice; page 10 second full paragraph, *taught as the scale factor being 1.5 at high*

speeds or 1, which is 2/3 of the maximum of 1.5, at low speeds).

8.(Currently Amended) A simulation system as recited in claim 1, wherein when said rear side slip angle is determined to not be greater than said predetermined threshold, said controller is alternatively programmed to determine an unscaled look ahead factor (design choice – essentially traveling in a straight line, therefore look-ahead is not critical; (page 6 last paragraph – page 7 first paragraph, *taught as when q1 and q2 are low, which keeps the vehicle on target, the steer angle is maintained*).

9. A simulation system as recited in claim 1, wherein said controller is programmed to determine said new steering wheel angle when said vehicle computer model is determined to not be headed on target, and said target is associated with said intended vehicle path (page 10, second full paragraph, *taught as "using the perceived path error to steer the 'correct' way"*);.

Claims 10-18 are similarly rejected.

19. A method of operating a vehicle computer model having vehicle information and path information therein, said method comprising the steps of: determining a rear side slip angle (pg. 3, fig. 2) of said vehicle computer model (page 1 last paragraph lines 8-11; page 5 figure 3; angle of curvature of road *is proportional to slip angle*); determine an initial steering wheel angle that is input to said vehicle computer model (page 6 first full paragraph, *when k=1*);; determining an initial steering wheel angle that is input to said vehicle computer model (page 6 first full paragraph, *when k=1*);
determining a look ahead point that is substantially on or near an intended vehicle path for said vehicle computer model (page 5 figure 3, *taught as computing the road angle which corresponds to the slip angle*; page 10, *second full paragraph, taught as setting a preview time based on the curvature of the path which is proportional to slip angle*);
when said rear side slip angle is determined to be greater than a predetermined threshold, determining a look ahead scale factor and increasing the distance of said look ahead point as a function of said look ahead scale factor (page 10, *second full paragraph, taught as using the preview time in order to determine the preview point ahead of the car*);
when said rear side slip angle is alternatively determined to be less than said predetermined threshold, maintaining the distance of said look ahead point (page 6 last paragraph – page 7 first paragraph, *taught as when q1 and q2 are low, which keeps the vehicle on target, the steer angle is maintained*);
when said vehicle computer model is determined to be headed off a predetermined target, determining a new steering wheel angle, which is input to said vehicle computer model -by comparing said intended vehicle path with said look ahead point on or near said intended vehicle path (page 10, second full paragraph, *taught as "using the perceived path error to steer the 'correct' way"*);
operating said vehicle computer model with said initial steering wheel angle or said new steering wheel angle input (page 5 last paragraph-page 6 first paragraph, *taught as using the system with the steering wheel angle input*); and
generating an output in response to said vehicle computer model and said initial steering wheel angle or said new steering wheel angle (page 5 figure 4, *taught as the error being based on the steering wheel angle input)*.

20. A method as recited in claim 19, wherein said look ahead scale factor is determined as a function of an exponential of said rear side slip angle (arbitrary use of the exponential function; page 10, *second full paragraph, taught as setting a preview time based on the curvature of the path, which is proportional to slip angle*).

Response to Arguments

7. Applicant's arguments filed 10/9/2008 have been fully considered.

8. Applicant's arguments with respect to the prior art have been considered but are not persuasive.

9. Applicants argue (pg. 9):

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> The Peng et al. reference teaches controlling steering wheel angle using known road curvature information that is measured from the road geometry or obtained from transportations agencies, and retrieved from an on-board database, read from discrete magnetic reference markers, or transmitted from road to vehicle by an available means and uses this information as a curvature of the road in determining an optimal preview control for a vehicle. Peng et al. also assumes a finite preview time in that at time, t, the road curvature is assumed to be known. Therefore, Peng et al. does not teach or disclose computing an "intended vehicle path" and is incapable, even in combination with Sharp et al., of simulating control of a vehicle in various driving conditions, such as understeer and oversteer.

The argument is contradictory because measuring the curvature means that the curvature cannot have been pre-known. Furthermore, the specification (par. 33-36) was carefully reviewed to determine the meaning of "intended vehicle path". There does not appear to be any disclosed algorithm for planning and/or knowing the path in the manner implied in Applicant's arguments. In fact, the specification only teaches:

> [0035] Referring now to FIGS. 6 and 7, a method for controlling the vehicle model during aggressive maneuvers is illustrated. The look ahead scale factor is

> changed as the function illustrated in FIG. 6. That is, the look ahead scale factor is normally 1. However, during a straight driving condition, the look ahead scale factor is reduced to 62-1/2 percent or 0.625 of the nominal look ahead scale factor. The scale factor increases as a function of the curvature of the road. Thus, as the curvature of the path increases, the look ahead scale factor also increases. In the present example, the look ahead scale factor is directly proportional (has a slope corresponding) to the curvature of the path. However, those skilled in the art will recognize that various curves may also be used depending on the vehicle. It should be noted that the curvature changes as a function of a negative and positive curvature of the path.

In any case, the intended path is that the driver wishes to traverse. The title of the Peng paper is "Optimal preview control for vehicle lateral guidance" - using the preview to maintain an intended path.

10. The conclusion to the Peng paper states:

6. Conclusions

The preview control action, which utilizes the curvature and superelevation of the road ahead, has been incorporated in the vehicle lateral control law. The controller design was based on the FSLQ optimal control theory. Results of the frequency-domain analysis show that the preview control law simultaneously improves the low frequency tracking performance and reduces high frequency lateral acceleration. Furthermore, results from the numerical simulation study show that the preview control algorithm enables the vehicle to track the center of a lane with a small tracking error (< 20 cm) under all the hypothetical scenarios.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is

filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hugh Jones whose telephone number is (571) 272-3781. The examiner can normally be reached on M-Th.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamini Shah can be reached on (571) 272-2279. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Hugh Jones/
Primary Examiner, Art Unit 2128